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**Notes on the biology and ecology of
Zygaena (Mesembrynus) alpherakyi SHELJUZHKO 1936
(Lepidoptera: Zygaenidae)**

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A b s t r a c t : *Zygaena (Mesembrynus) alpherakyi* SHELJUZHKO 1936 is a highmountain species endemic to the Caucasus range. Its ecology, ethology, phenology and early stages are described in detail for the first time.

K e y w o r d s : *Zygaena alpherakyi*, biology, ecology, early instans, Dagestan, Caucasus

Introduction

The principal objective of a visit to Dagestan in the south-eastern Caucasus during the second half of July 1996 was to locate and observe *Zygaena (Mesembrynus) alpherakyi* SHELJUZHKO 1936, a high-mountain species endemic to the Caucasus range and closely related to *Z. (M.) purpuralis* (BRÜNNICH 1763). Our expedition was organised entirely by Dr Zheniya Roitberg (University of Moscow) who obtained the necessary permission and travel permits from government and military authorities and who not only acted as interpreter but very ably smoothed the way when we encountered difficulties whilst in Dagestan. Moreover, his intimate knowledge of the ecology and natural history of the region was indispensable when planning our trip.

Accompanied by colleagues from the University of Makhachkala, we left Kaspiysk on the Caspian coast on 16 July and travelled via Derbent by minibus to Kurush (Fig. 2) which, at 2600 m, is the highest village in Dagestan. Near the village of Garakh the road crossed to the southern side of the Samur river into a small strip of land only a few kilometres in length and bordering the independent state of Azerbaijan. Before we reached the bridge we were stopped at a checkpoint by the Russian military who were unwilling for us to proceed in spite of the fact that we had obtained written permission from the highest military authority in Dagestan; after some argument and several telephone calls, we were eventually allowed to go through but under armed escort! Needless to say, we encountered no problems in the disputed area nor did we meet anyone, official or otherwise; moreover, had we done so, we doubt very much that we would have had any problems. We noted that a new road was being constructed by the Russian authorities on the northern (Russian) side of the river, a project that is probably now completed so that anyone visiting Kurush in the future should not become involved in such complications. Once away from the border with Azerbaijan, we bypassed the villages of Achty and Terek, all well-known localities for *Zygaena* species. Eventually the road began to climb and then its surface deteriorated rapidly; consequently, the engine of our minibus overheated continuously so that we had to stop frequently to allow it to cool (this was not surprising as it was heavily overloaded and contained nine people, our camping equipment and a week's supply of food!). Fortunately a Russian military lorry overtook us on its way to Kurush; the soldiers kindly off-loaded our food, equipment and some of our personnel and went to the village ahead of us so

that we were then able to proceed without difficulty. We eventually reached Kurush at 20.00 h and spent the night in one of the better houses owned by a villager who was a friend of one of our Russian companions from Makhachkala (the majority of the houses are built of mud with low flat roofs). The wife of our host kindly provided us with an excellent supper of freshly made, home-baked bread, cheese and yogourt washed down with numerous glasses of tea. This was followed by the inevitable vodka and as we were obliged to participate in innumerable toasts it was difficult to avoid becoming completely intoxicated, unlike our host. Needless to say we slept well that night in spite of being tightly packed on the floor of a small room!

The following morning we awoke to admire an excellent view from our 'bedroom' window of Bazar-Dyuzi (Fig. 1), the upper parts of which were covered in snow which dazzled in the bright sunshine. At 4466 m, Bazar-Dyuzi is the highest mountain in Dagestan and is situated on the south-west side of the Pereval Kurush or Kurush Pass over which a mule track crosses into Azerbaijan. Incidentally, a fascinating account of travelling in Dagestan in the 1880s is given by RADDE (1887) whose paper includes a map of the region and delightful engravings of the mountains surrounding Kurush, including Bazar-Dyuzi and Shalbuzdag. In spite of its mud-built houses, narrow unpaved streets and predominant but not unpleasant smell of sheep and cow dung, Kurush nevertheless has a telephone system and electricity, the latter providing power for numerous television sets that appear to be a status symbol amongst the wealthier inhabitants of the village. Our host provided us with breakfast (the same menu as supper but fortunately without the vodka) after which we departed and set up camp by the Kurush river at 2300 m in the floor of the valley.

From 17–24 July we explored the high-mountain regions on both sides of the Kurush river. During our stay we discovered *Z. (M.) alpherakyi* in three locations, viz. at 3250 m on Shalbuzdag (Fig. 2), a mountain situated immediately above the village of Kurush and consequently much overgrazed by domestic herbivores, at 2900–3100 m on Yaridag and at 2900–3200 m on Bazar-Dyuzi (Fig. 3), the last two mountains being less heavily grazed and which, respectively, guard the north-east and south-west sides of the Pereval Kurush. The habitats of *Z. (M.) alpherakyi* were at 2900–3250 m while our campsite was at 2300 m, therefore it was necessary to set off at 06.00 h and walk at a steady pace for three hours in order to reach them before the sun became unbearably hot.

***Zygaena (Mesembrynus) alpherakyi* SHELJUZHKO 1936**

Zygaena pilosellae (ESPER 1780) sensu ROMANOFF 1884, *Mémoires sur les Lépidoptères* 1: 78. [Misidentification.]

Zygaena (Mesembrynus) alpherakyi SHELJUZHKO 1936, *Folia zool. hydrobiol.* 9: 17.

Zygaena (Mesembrynus) alpherakyi is an alpine species endemic to the Caucasus, its range extending from Dagestan (nominotypical subspecies) to North Osetia (subsp. *ossetica* HOLIK 1939) (HOFMANN & TREMEWAN 1996: 76). In the literature it was first recorded from 'Kourouche' by ROMANOFF (1884: 74) under the name '*Zygaena pilosellae* ESP.', i.e. *Z. (M.) purpuralis*. 'Kourouche' refers to Kurush which is situated immediately to the north of the border with Azerbaijan and which, at 2600 m, is the highest village in Dagestan. For many years the species was known from specimens that had been collected by H. Christoph and placed in collections under the manuscript name '*alpherakyi* CHR.'; moreover, it was even listed in the literature as a nomen nudum, '*Alpherakii* Chr. Kursch.', by RADDE (1899: 423) (in a list of abbreviations on pp. 333–334, 'Kursch.' is cited as an abbreviation of 'Kurusch'!). However, it was SHELJUZHKO (1936: 17) who formally described the taxon, thereby making the name available. The type-series (11♂, 4♀) was collected by M. Ryabov from 16–25.viii.1933 at 10000–12000 ft (3050–3660 m) on Gora Shakhdag, a mountain situated in Azerbaijan and ca 20 km due south of Kurush; a male labelled 'Kurush' and '*Z. Alpherakyi* CHR.' was also mentioned by Sheljuzhko in the original description. In 1939 L. Sheljuzhko and his colleague

N. Pavlitskaya took a very large series of both sexes at 3300 m about 6 km from Kurush (HOLIK & SHELJUZHKO 1953: 200); it is of interest to note that their observations on the biology and ecology of *Z. (M.) alpherakyi* were very similar to ours. According to circumstantial evidence, ROMANOFF'S record (1884: 74) refers to specimens that were first collected by Christoph, but we have been unable to find any reference in the literature to substantiate this, not even in Christoph's paper 'Sammelergebnisse aus Nordpersien, Krasnowodsk in Turkmenien und dem Daghestan' (CHRISTOPH 1876–1877). In this work, CHRISTOPH (1877: 204) does record '*Zygaena pilosellae* ESP.', but from 'Kurach', not 'Kurusch'; from the latter locality only two examples of '*Zygaena meliloti* var. *dahurica* B.', i.e. *Z. (Z.) viciae* ([DENIS & SCHIFFERMÜLLER] 1775), are listed by him! Incidentally, it should be noted that we did not find *Z. (Z.) viciae* in the vicinity of Kurush although we took small series of *Z. (Z.) loti* ([DENIS & SCHIFFERMÜLLER] 1775) and *Z. (Z.) lonicerae* (SCHEVEN 1777). Subsequent to ROMANOFF'S publication in 1884, Christoph did in fact collect *Z. (M.) alpherakyi* at Kurush for there are three examples in the Natural History Museum, London (BMNH) with the following pin-label data: 1 ♂, 1 ♀ 'Ex Coll. H. J. Elwes, 1920.'; 'Joicey Bequest Brit. Mus. 1934–120.'; 'ex coll. Christoph. Kurush 21.7.86'; both specimens also have Christoph pin-labels 'm Kurusch' and '21.7.86 alpherakii' on the verso (it should be noted that the female is erroneously labelled as a male); 1 ♀, with the same data labels but with the date '23.7.86'. It is probable that Christoph collected *Z. (M.) alpherakyi* immediately above the village of Kurush, i.e. on the southern slopes of Shalbuzdag where we also found it, but in small numbers only owing to overgrazing by domestic herbivores.

Ovum (Fig. 4). Pale yellow to yellow, becoming dark grey prior to hatching; deposited in small, irregularly shaped batches of ca 20–100 eggs on the underside of stones, the latter almost always about 10–15 cm in diameter. The eggs were heavily parasitized by *Telenomus zygaenae* KIEFFER 1913 (Hymenoptera: Scelionidae) (det. A. Polaszek).

Larva (Figs 5, 6). First instar: head and thoracic legs black; body pale yellowish brown or brownish beige, anterior dorsal spots dark brown, each spot coalescing with a posterior brown suffusion to form an irregular, brown dorsal band, posterior dorsal spots absent, a series of pale or whitish yellow spots beneath, each spot situated in posterior part of segment, from second thoracic to seventh abdominal, subdorsal spots brown, lateral spots pale brown, peritreme of spiracles black, venter off-white.

Second instar: similar to first instar, but markings darker, more pronounced, a greyish white mediodorsal line, yellow spots darker, venter grey.

Third instar: head and thoracic legs black; body grey, anterior dorsal spots blackish grey, merging with D setal groups, yellow spots present on thoracic segments 2 and 3 (that on 2 paler) and abdominal segments 1–8 (that on 8 smaller), SD and L pinacula dark grey, peritreme of spiracles black.

Fourth to seventh instars: body dark grey, anterior dorsal spots blackish grey, merging with D setal groups or verrucae, bright yellow spots prominent, present on thoracic segments 2 and 3 (that on 2 smaller) and abdominal segments 1–8 (that on 8 smaller); SD and L verrucae dark grey or blackish grey; peritreme of spiracles black.

In contrast to Sheljuzhko and Pavlitskaya, we did not find larvae in any instar; however, according to them (HOLIK & SHELJUZHKO, 1953: 201) the fully grown larva is entirely black, the venter dirty reddish grey, with a series of yellow spots on either side of the abdomen. It may therefore be assumed that the final instar is not unlike the fourth to seventh instars obtained by us ab ovo. The larval host-plant is an unidentified species of *Thymus*; in captivity the larvae were reared to the seventh instar on *Thymus praecox* OPIZ subsp. *arcticus* (E. DURAND) JALAS, *T. pulegioides* L. and *T. serpyllum* L. Unfortunately the larvae died in the spring during or following diapause in the fifth, sixth and seventh instars.

Pupa and cocoon (Fig. 7). Pupa dark brown or brownish black, abdomen lighter; the pupal exuviae almost invariably become detached from the cocoon during eclosion of the adult. Cocoon bluntly fusiform, weakly ribbed and wrinkled, shiny, yellowish white; spun concealed under rocks and stones or in tufts of grass.

Imago (Fig. 8). The adults are active only when the sun is shining and, like most high-mountain species, they immediately drop to the ground to seek shelter under stones if the sun clouds over or if there is a sudden gust of wind. In suitable conditions the flight period extends from 10.00–15.00 h. Before 09.00 h very few adults can be found and then only pairs that have remained in copula overnight. If a passing cloud casts a shadow over the habitat during the early part of the flight period, the moths that are already active will stop flying and rest in a vertical position on vegetation or on rocks with their dorsal surface facing east, thereby gaining maximum solar radiation. During poor weather and at night they hide under stones or are concealed in small tufts of grass. Their flight is rather similar to that of *Z. (M.) purpuralis*, i.e. slow and buzzing just a few centimetres above the surface of the ground but they will fly strongly if disturbed; the males appear to spend much of their time searching for females while the latter can often be seen crawling on the ground or over the sparse vegetation, presumably looking for oviposition sites. Both sexes nectar almost exclusively at the reddish purple flowers of *Oxytropis albana* Stev. (*O. cyanea* M. BIEB.), but very occasionally at those of the larval host-plant (*Thymus* sp.).

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Fig. 1. View of Bazar-Dyuzi from the village of Kurush.

Fig. 2. View from Yaridag of Shalbuzdag.



Fig. 3. A habitat for *Z. (M.) alpherakyi* on Bazar-Dyuzi, 2900–3200 m.



Fig. 4. Eggs of *Z. (M.) alpherakyi*.



Fig. 5. First instar larva of *Z. (M.) alpherakyi*.



Fig. 6. Seventh instar larva of *Z. (M.) alpherakyi*.



Fig. 7. Cocoon of *Z. (M.) alpherakyi*.



Fig. 8. Adult of *Z. (M.) alpherakyi*.